Published in final edited form as:
Am J Obstet Gynecol. 2009 May ; 200(5): 557.e1–557.e5. doi:10.1016/j.ajog.2008.11.008.

Association between urinary incontinence and depressive symptoms in overweight and obese women

Vivian W. SUNG, MD, MPH[1], **Delia S. WEST, PhD**[2], **Alexandra L. HERNANDEZ, MPH**[3], **Thomas L. WHEELER II, MD, MSPH**[4], **Deborah L. MYERS, MD**[1], and **Leslee L. SUBAK, MD**[5] **for the Program to Reduce Incontinence by Diet and Exercise (PRIDE)**

1 *The Division of Urogynecology and Reconstructive Pelvic Surgery, Department of Obstetrics and Gynecology, Alpert Medical School at Brown University, Providence, RI*

2 *University of Arkansas for Medical Sciences, College of Public Health, Little Rock, AR*

3 *University of California, San Francisco, Department of Medicine, San Francisco, CA*

4 *University of Alabama at Birmingham, Department of Obstetrics and Gynecology, Birmingham, AL*

5 *University of California, San Francisco, Departments of Obstetrics, Gynecology & Reproductive Sciences, Epidemiology & Biostatistics, and Urology, San Francisco, CA*

Abstract

OBJECTIVE—Determine the association between urinary incontinence (UI) and depressive symptoms.

STUDY DESIGN—Cross-sectional study of 338 incontinent and overweight women at baseline in the Program to Reduce Incontinence by Diet and Exercise trial. Depressive symptoms were defined as a Beck Depression Inventory score ≥ 10. UI frequency was determined by 7-day voiding diary. Symptom bother and quality of life were determined using the Urogenital Distress Inventory (UDI) and the Incontinence Impact Questionnaire (IIQ). Multivariable regression was used to estimate the association between UI and depressive symptoms.

RESULTS—Women with depressive symptoms (N=101) reported a higher mean number of UI episodes per week (28 vs. 23, P=.005) and higher (worse) mean scores on the UDI (176 vs. 162, P=.02) and IIQ (136 vs. 97, P<.001) compared to women without depressive symptoms. The risk of having depressive symptoms increased with each 7-episode increase in UI per week (AOR 1.10, 95% CI 1.01–1.21), each 50-point increase in UDI (AOR 1.27, 95% CI 1.01–1.60) and each 50-point increase in IIQ (AOR 1.44, 95% CI 1.22–1.71).

CONCLUSIONS—Urinary incontinence frequency, symptom bother, and quality of life are independently associated with depressive symptoms in overweight and obese women.

Keywords

depressive symptoms; obesity; urinary incontinence

Correspondence: Vivian W. Sung, MD, MPH, Division of Urogynecology and Reconstructive Pelvic Surgery, Women and Infants' Hospital/Warren Alpert Medical School at Brown University, 695 Eddy Street, Providence, RI 02903, E-mail: vsung@wihri.org. Reprints are not available.

Presented at the Twenty-Ninth Annual Meeting of the American Urogynecologic Society, September 4–6, 2008, Chicago, Illinois

Introduction

Urinary incontinence (UI) is a common condition associated with embarrassment, social and physical functional impairment, and economic burden.[1–3] The association between psychological distress and UI can be difficult to measure. While many studies have reported a positive association between depressive symptoms and UI,[4–10] other studies suggest that there is no association after adjusting for co-existing urogenital symptoms.[11] Large epidemiologic studies can be limited in the rigor with which UI is assessed and such studies often use non-validated survey questions to define UI.[5, 7, 10] Other studies only measure one aspect of UI, such as symptom bother or quality of life.[6, 11] These variations in how UI is defined may lead to an incomplete picture regarding the relationship between UI and depression.

The relationship between UI and depressive symptoms remains poorly understood and improving our knowledge regarding this association is critical for a more comprehensive understanding of the burden of incontinence.[12] The primary objective of this study was to determine the association between UI and depressive symptoms in a population of overweight and obese women with incontinence using three validated measures of UI.

Material and Methods

A total of 338 incontinent and overweight or obese women in the Program to Reduce Incontinence by Diet and Exercise (PRIDE) clinical trial were randomized to a 6-month lifestyle intervention (weight loss and exercise) or a structured education program. The details and findings of this trial are currently in submission. In brief, women at least 30 years of age with body mass index (BMI) of 25–50 kg/m^2 who reported 10 or more urinary incontinent episodes on a 7-day voiding diary were eligible for the study. Among other inclusion criteria, women had to agree not to initiate new treatments for UI for the duration of the study. The primary outcome was change in self-reported incontinence episodes on a 7-day voiding diary 6 months after randomization. Institutional Review Board approval was obtained at all participating sites.

For this secondary analysis, we used three validated instruments to measure UI at baseline. The frequency of UI episodes was measured using a 7-day voiding diary, UI symptom bother was measured using the 19-item Urogenital Distress Inventory (UDI)[13] and UI-specific quality of life was measured using the 30-item Incontinence Impact Questionnaire (IIQ).[13] Participants were trained to complete the 7-day voiding diary. Each UI episode was identified by the participant as stress (involuntary loss of urine with coughing, sneezing, straining or exercise), urge (loss of urine associated with a strong need or urge to void), or other, based on instructions provided. Any questions or inconsistencies were reconciled between an interviewer and the participant. The UDI and IIQ were completed in a self-administered fashion to measure the degree to which symptoms associated with UI bothered women (symptom severity) and the impact of UI on life aspects (quality of life), respectively. Both the UDI and IIQ are scored from 0 to 400, with higher scores indicating more severe UI symptoms or life impact.

At baseline, all participants also completed the self-administered 21-item Beck Depression Inventory (BDI), a widely used screening questionnaire that assesses depressive symptoms.[14] The BDI has been shown to be psychometrically sound in multiple community and clinical samples.[15–17] The BDI is scored on a scale of 0 to 63 with higher scores indicating more severe depressive symptoms. Previous studies have demonstrated that BDI scores of 10 or greater are associated with mild to severe depressive syndromes with good sensitivity (86.4–

100%) and specificity (81.8%–83.1%) compared to clinical diagnosis made by trained psychiatric interviewers using International Classification of Diseases (ICD)-10th Edition and The Diagnostic and Statistical Manual of Mental Disorders (DSM) III diagnostic criteria.[18, 19] Based on recommended BDI cut points and these previous findings, we categorized women as either not having depressive symptoms (BDI score of less than 10) or as having depressive symptoms (BDI score of 10 or greater).

Demographic information, gynecological, obstetrical, medical and surgical histories were obtained by self-report. Associations between depressive symptoms, sociodemographic factors and urinary incontinence were evaluated using ANOVAs or ranked ANOVA for continuous variables and chi-square tests for categorical variables. Multivariable logistic regression was used to identify independent risk factors for depressive symptoms. Because we found that urinary frequency on voiding diary, UDI and IIQ scores were correlated with each other (r = .3 for voiding diary and UDI scores and r = .4 for voiding diary and IIQ scores), we constructed three separate models to evaluate the association between the three measures of UI and depressive symptoms. Frequency of UI was analyzed as 7-episode increments on a 7-day voiding diary for ease of interpretation. The UDI and IIQ scores were analyzed as 50-point increments. This cut-off was chosen because currently, the minimum clinically important difference for these questionnaires is unclear and previous studies have shown that treatments for PFDs are associated with improvements in UDI and IIQ scores between 30–60 points.[20] Initial models included age, race, education, smoking status, BMI, diabetes, cerebrovascular disease, chronic heart disease and the measures of urinary incontinence. Variables with $P \leq 0.1$ were retained in the final multivariable models, with BMI forced into the final model. All analyses were performed using SAS 9.0 (SAS Institute Inc., Cary, North Carolina).

Results

The demographic and clinical characteristics of our study population are presented in Table I. At baseline, 101 participants (30%) had BDI scores ≥ 10, and were defined as having depressive symptoms. Compared to women without depressive symptoms, women with depressive symptoms were younger (mean age 51 vs. 54 years, P=.03), less likely to have above high school education (81% vs. 89%, P=.05) and had minimally higher BMI (mean 37 vs. 36 kg/m^2, P=.06). There was no difference in the proportion of women in the overweight (BMI 25–29), obese (BMI 30–39) or severely obese (BMI 40 or more) categories who reported depressive symptoms and those who did not (P=.30). There was no difference in the presence of comorbidities (diabetes, coronary heart disease, cancer, peripheral vascular disease, cerebral vascular accident, multiple sclerosis or Parkinson's Disease), or the number of women who had prior UI surgery between those with and those without depressive symptoms (P>.10 for all).

Women with depressive symptoms reported a higher number of UI episodes per week on the 7-day voiding diary (mean 28 vs. 23 UI episodes, P=.005), a higher number of stress UI episodes per week (11 vs. 9, P=.05), and higher (worse) scores on both the UDI (mean 178 vs. 162, P=.02) and the IIQ (mean 136 vs. 97, P<.001) compared to those without depressive symptoms.

In multivariable logistic regression analyses all three measures of UI were associated with the presence of depressive symptoms on the BDI, after adjusting for age, education level, and BMI (See Table 2). Adding smoking status, race and comorbidities including diabetes, cerebrovascular accident, and coronary heart disease did not change our findings and were excluded from our final models. We found that each 7-episode increase in UI on voiding diary was associated with increased odds of depressive symptoms (AOR 1.10, 95% CI 1.01–1.21). Each 50-point increase in UDI score was associated with an increased odds of depressive

symptoms (AOR 1.27, 95% CI 1.01–1.60) and each 50-point increase in IIQ score was also associated with an increased odds of depressive symptoms (AOR 1.44, 95% CI 1.22–1.71).

Comment

In this study of overweight and obese women, we found a strong and independent association between depressive symptoms and frequency of UI, degree of bother of UI symptoms (UDI score), and quality of life impact of UI symptoms (IIQ score) measured using three validated measures. This association persisted after adjusting for established risk factors for major depression including age, education level and BMI.[21–25] Consideration of other established risk factors for depression, including smoking, race and medical comorbidities did not change our findings.

Although there is a growing body of evidence supporting an association between UI and depression, measures of UI used in previous studies are highly variable, ranging from non-validated single survey questions to validated symptom and quality of life tools. Recent studies have suggested that self-report of UI symptom severity and UI frequency can be significantly affected by recall bias. In a study by Kenton et al, women with urge incontinence overestimated the frequency of incontinence episodes on self-report compared to voiding diaries and this effect was more pronounced in women who were more bothered by UI based on UDI and IIQ scores.[26] A study by Lowenstein et al suggests that the short forms of the UDI and IIQ do not correlate with the number of stress or urge UI episodes on 7-day voiding diary.[27] These findings suggest that the frequency of UI episodes per week, the degree to which UI bothers women (measured by the UDI), and quality of life impact (measured by the IIQ) are related, but reflect different aspects of the burden of incontinence and may depend on the way they have been measured. Studies in other fields also support that although symptoms, functioning and quality of life may be related, they are distinct concepts that are not necessarily interchangeable.[28]

In PRIDE, we used three validated instruments to measure the burden of UI. For degree of bother and life impact of UI symptoms, our findings using the UDI and IIQ are consistent with other studies utilizing validated self-reported measures, suggesting that subjects who report significantly higher symptom severity and life impact also report higher depressive symptoms on self-reported measures.[4, 6] However, self-reported measures can be limited by recall bias. Also, it may be argued that women who tend to over-report or under-report severity of UI symptoms may also over- or under-report severity of depressive symptoms on self-reported measures. In our study, we were able to collect data on UI frequency using 7-day voiding diaries, which are less commonly used in large epidemiologic studies due to feasibility. The 7-day voiding diary has been shown to be a reliable, valid and stable measure of UI frequency, which significantly limits the impact of recall bias.[29, 30] Based on these data, we found that UI frequency is also strongly associated with the presence of depressive symptoms.

We used a BDI score of 10 or greater to define the presence of depressive symptoms. Although BDI score ranges have not been specifically studied in women with UI, a score of ≥ 10 to define the presence of depressive symptoms is consistent with the criterion used in other research and has been shown to have excellent sensitivity and specificity compared to clinical diagnosis using established diagnostic criteria.[18, 19] It should be noted that the BDI is a screening tool for depression rather than a diagnostic tool; thus these methods do not firmly establish a clinical diagnosis of depression. However, we would expect that any issues with misclassification would be non-differential, which would bias our results towards the null. A previous study by Melville et al[31] used the PRIME-MD Patient Health Questionnaire, which has been shown to have excellent agreement with the diagnosis of major depression based on structured psychiatric interview,[32] also found that women with moderate to severe incontinence had an

increased odds of major depression, consistent with current findings. Other studies have suggested that the strength of association between depression and incontinence depends on the instrument used to classify depression.[7] Therefore, it is possible that if we used a different instrument to measure depressive symptoms in our study population, our findings might have been of different magnitude.

Our study population included only overweight and obese women who met eligibility criteria to participate in the PRIDE study. Obesity is an established independent risk factor for both depression and incontinence.[23, 25, 33–36] Although the mean BMI was not different between women with and without depressive symptoms, we controlled for this potential confounder in our multivariable regression nevertheless. However, because our study population included only overweight and obese women, our external validity may be limited and our findings may not apply to normal weight women with UI, or overweight and obese women who do not volunteer to participate in a randomized trial for behavioral weight loss.

The cross-sectional design of our study does not allow us to determine the causal relationship between UI and depressive symptoms. Studies have suggested that depression and UI may share a common biochemical pathway.[6, 7, 9, 37] Other authors have suggested that improvement of UI through biofeedback improves depressive symptoms and the psychological burden of UI by changing a woman's perception of control.[38] It is also possible that depressive symptoms cause a heightened awareness of UI symptoms. Although the exact mechanism and relationship between depression and UI is still unclear, our study and others highlight the importance of screening for depressive symptoms in women with UI in a clinical setting and the need for future studies to further evaluate this relationship in a research setting. This may lead to future recommendations regarding optimal treatment of women with both depressive symptoms and UI.

In conclusion, the frequency of urinary incontinence episodes, and the degree of bother and life impact of UI symptoms are all associated with self-reported depressive symptoms among overweight women, independent of weight. Future research is needed to further determine if treating one of these conditions may lead to improvement in the other.

Acknowledgments

The authors wish to acknowledge the contribution made by PRIDE investigators, staff, consultants, sponsor and Data and Safety Monitoring Board:

The **University of Alabama at Birmingham** – Frank Franklin, MD, PhD (Principal Investigator), Holly E. Richter, PhD, MD (Co-Investigator), Kathryn L. Burgio, PhD (Co-Investigator), Leslie Abdo, BSN, RN, CCRC, Charlotte Bragg, MS, RD, LD, Kathy Carter, RN, BSN, Juan Dunlap, Stacey Gilbert, MPH, Sara Hannum, Anne Hubbell, MS, RD, LD, Karen Marshall, Lisa Pair, CRNP, Penny Pierce, RN, BSN, Clara Smith, MS, RD, Sue Thompson, RN, Janet Turman, Audrey Wrenn, MAEd.

The Miriam Hospital - Rena Wing, PhD (Principal Investigator), Amy Gorin, PhD (Co-Investigator), Deborah Myers, MD (Co-Investigator), Tammy Monk, MS, Rheanna Ata, Megan Butryn, PhD, Pamela Coward, MEd, RD, Linda Gay, MS, RD, CDE, Jacki Hecht, MSN, RN, Anita Lepore-Ally, RN, Heather Niemeier, PhD, Yael Nillni, Angela Pinto, PhD, Deborah Ranslow-Robles, Phlebotomist/MedAsst, Natalie Robinson, MS, RD, Deborah Sepinwall, PhD, Margaret E. Hahn, MSN, RNP, Vivian W. Sung, MD, MPH, Victoria Winn, Nicole Zobel.

The **University of Arkansas for Medical Sciences** – Delia West, PhD (Investigator). The **University of Pennsylvania** – Gary Foster, PhD (Consultant).

The **University of California, San Francisco (Coordinating Center) –** Deborah Grady, MD, MPH (Principal Investigator), Leslee Subak, MD (Co-PI), Judith Macer, Ann Chang, Jennifer Creasman, MSPH, Judy Quan, PhD, Eric Vittinghoff, PhD, Jennifer Yang.

Supported by grants #U01 DK067860, U01 DK067861 and U01 DK067862 from The **National Institute of Diabetes and Digestive and Kidney Diseases –** John W. Kusek, PhD, Leroy M. Nyberg, MD, PhD (Project Officers).

Data and Safety Monitoring Board

The **University of Utah Health Sciences Center** - Ingrid Nygaard, MD (DSMB Chairperson)

The **Children's Hospital Boston** - Leslie Kalish, ScD

The **University of California, San Diego** - Charles Nager, MD

The **Medical University of South Carolina** - Patrick M. O'Neil, PhD

The **Johns Hopkins School of Medicine** - Cynthia S. Rand, PhD

The **University of Virginia Health Systems** - William D. Steers, MD

Funding support: Supported by Grant Numbers U01DK067860, U01DK067861, U01DK067862 from the National Institute of Diabetes and Digestive and Kidney Diseases and Office of Research in Women's Health.

Dr. Sung is supported by grant 5-K12-HD050108-02; WIH/Brown Women's Reproductive Health Research Career Development Award; National Institute of Child Health and Human Development.

References

1. RAGINS AI, SHAN J, THOM DH, SUBAK LL, BROWN JS, VAN DEN EEDEN SK. Effects of urinary incontinence, comorbidity and race on quality of life outcomes in women. J Urol 2008;179:651–5. [PubMed: 18082212]discussion 655
2. SUBAK L, VAN DEN EEDEN S, THOM D, CREASMAN JM, BROWN JS. Urinary incontinence in women: Direct costs of routine care. Am J Obstet Gynecol 2007;197(596):e1–9. [PubMed: 17880904]
3. SUBAK LL, BROWN JS, KRAUS SR, BRUBAKER L, LIN F, RICHTER HE, et al. The "costs" of urinary incontinence for women. Obstet Gynecol 2006;107:908–16. [PubMed: 16582131]
4. COYNE KS, SEXTON CC, IRWIN DE, KOPP ZS, KELLEHER CJ, MILSOM I. The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: results from the EPIC study. BJU Int 2008;101:1388–95. [PubMed: 18454794]
5. GOODE PS, BURGIO KL, REDDEN DT, MARKLAND A, RICHTER HE, SAWYER P, et al. Population based study of incidence and predictors of urinary incontinence in black and white older adults. J Urol 2008;179:1449–53. [PubMed: 18295279]discussion 1453–4
6. MELVILLE JL, DELANEY K, NEWTON K, KATON W. Incontinence severity and major depression in incontinent women. Obstet Gynecol 2005;106:585–92. [PubMed: 16135592]
7. NYGAARD I, TURVEY C, BURNS TL, CRISCHILLES E, WALLACE R. Urinary incontinence and depression in middle-aged United States women. Obstet Gynecol 2003;101:149–56. [PubMed: 12517660]
8. STEERS WD, LEE KS. Depression and incontinence. World J Urol 2001;19:351–7. [PubMed: 11760784]
9. ZORN BH, MONTGOMERY H, PIEPER K, GRAY M, STEERS WD. Urinary incontinence and depression. J Urol 1999;162:82–4. [PubMed: 10379745]
10. TENNSTEDT SL, LINK CL, STEERS WD, MCKINLAY JB. Prevalence of and risk factors for urine leakage in a racially and ethnically diverse population of adults: the Boston Area Community Health (BACH) Survey. Am J Epidemiol 2008;167:390–9. [PubMed: 18182376]
11. VAN DER VAART CH, ROOVERS JP, DE LEEUW JR, HEINTZ AP. Association between urogenital symptoms and depression in community-dwelling women aged 20 to 70 years. Urology 2007;69:691–6. [PubMed: 17445653]
12. LANDEFELD CS, BOWERS BJ, FELD AD, HARTMANN KE, HOFFMAN E, INGBER MJ, et al. National Institutes of Health state-of-the-science conference statement: prevention of fecal and urinary incontinence in adults. Ann Intern Med 2008;148:449–58. [PubMed: 18268289]
13. SHUMAKER SA, WYMAN JF, UEBERSAX JS, MCCLISH D, FANTL JA. Health-related quality of life measures for women with urinary incontinence: the Incontinence Impact Questionnaire and

the Urogenital Distress Inventory. Continence Program in Women (CPW) Research Group. Qual Life Res 1994;3:291–306. [PubMed: 7841963]

14. BECK AT, WARD CH, MENDELSON M, MOCK J, ERBAUGH J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71. [PubMed: 13688369]
15. FOELKER GA JR, SHEWCHUK RM, NIEDEREHE G. Confirmatory factor analysis of the short form Beck Depression Inventory in elderly community samples. J Clin Psychol 1987;43:111–8. [PubMed: 3558831]
16. SCOGIN F, BEUTLER L, CORBISHLEY A, HAMBLIN D. Reliability and validity of the short form Beck Depression Inventory with older adults. J Clin Psychol 1988;44:853–7. [PubMed: 3216010]
17. RICHTER P, WERNER J, HEERLEIN A, KRAUS A, SAUER H. On the validity of the Beck Depression Inventory. A review Psychopathology 1998;31:160–8.
18. FURLANETTO LM, MENDLOWICZ MV, ROMILDO BUENO J. The validity of the Beck Depression Inventory-Short Form as a screening and diagnostic instrument for moderate and severe depression in medical inpatients. J Affect Disord 2005;86:87–91. [PubMed: 15820275]
19. CATHEBRAS P, MOSNIER C, LEVY M, BOUCHOU K, ROUSSET H. Screening for depression in patients with medical hospitalization. Comparison of two self–evaluation scales and clinical assessment with a structured questionnaire. Encephale 1994;20:311–7. [PubMed: 8088234]
20. BARBER MD, WALTER MD, CUNDIFF GW. Responsiveness of the Pelvic Floor Distress Inventory (PFDI) and the Pelvic Floor Impact Questionnaire (PFIQ) in women undergoing vaginal surgery and pessary treatment for pelvic organ prolapse. Am J Obstet Gynecol 2006;194:1492–8. [PubMed: 16647933]
21. KATON W, VON KORFF M, CIECHANOWSKI P, RUSSO J, LIN E, SIMON G, et al. Behavioral and clinical factors associated with depression among individuals with diabetes. Diabetes Care 2004;27:914–20. [PubMed: 15047648]
22. WASSERTHEIL-SMOLLER S, SHUMAKER S, OCKENE J, TALAVERA GA, GREENLAND P, COCHRANE B, et al. Depression and cardiovascular sequelae in postmenopausal women. The Women's Health Initiative (WHI). Arch Intern Med 2004;164:289–98. [PubMed: 14769624]
23. KATON W. The Effect of Major Depression on Chronic Medical Illness. Semin Clin Neuropsychiatry 1998;3:82–86. [PubMed: 10085195]
24. DIXON JB, DIXON ME, O'BRIEN PE. Depression in association with severe obesity: changes with weight loss. Arch Intern Med 2003;163:2058–65. [PubMed: 14504119]
25. REJESKI WJ, LANG W, NEIBERG RH, VANDORSTEN B, FOSTER GD, MACIEJEWSKI ML, et al. Correlates of health-related quality of life in overweight and obese adults with type 2 diabetes. Obesity (Silver Spring) 2006;14:870–83. [PubMed: 16855197]
26. KENTON K, FITZGERALD MP, BRUBAKER L. What is a clinician to do-believe the patient or her urinary diary? J Urol 2006;176:633–5. [PubMed: 16813908]discussion 635
27. LOWENSTEIN L, KENTON K, FITZGERALD MP, BRUBAKER L. Clinically useful measures in women with mixed urinary incontinence. Am J Obstet Gynecol 2008;198(664):e1–3.discussion 664 e3–4
28. HAHN EA, CELLA D, CHASSANY O, FAIRCLOUGH DL, WONG GY, HAYS RD. Precision of health-related quality-of-life data compared with other clinical measures. Mayo Clin Proc 2007;82:1244–54. [PubMed: 17908530]
29. LOCHER JL, GOODE PS, ROTH DL, WORRELL RL, BURGIO KL. Reliability assessment of the bladder diary for urinary incontinence in older women. J Gerontol A Biol Sci Med Sci 2001;56:M32–5. [PubMed: 11193230]
30. WYMAN JF, CHOI SC, HARKINS SW, WILSON MS, FANTL JA. The urinary diary in evaluation of incontinent women: a test-retest analysis. Obstet Gynecol 1988;71:812–7. [PubMed: 3368165]
31. MELVILLE JL, KATON W, DELANEY K, NEWTON K. Urinary incontinence in US women: a population-based study. Arch Intern Med 2005;165:537–42. [PubMed: 15767530]
32. SPITZER RL, KROENKE K, WILLIAMS JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire Jama 1999;282:1737–44.

33. FONTAINE KR, BAROFSKY I, ANDERSEN RE, BARTLETT SJ, WIERSEMA L, CHESKIN LJ, et al. Impact of weight loss on health-related quality of life. Qual Life Res 1999;8:275–7. [PubMed: 10472159]

34. SUBAK LL, JOHNSON C, WHITCOMB E, BOBAN D, SAXTON J, BROWN JS. Does weight loss improve incontinence in moderately obese women? Int Urogynecol J Pelvic Floor Dysfunct 2002;13:40–3. [PubMed: 11999205]

35. SUBAK LL, WHITCOMB E, SHEN H, SAXTON J, VITTINGHOFF E, BROWN JS. Weight loss: a novel and effective treatment for urinary incontinence. J Urol 2005;174:190–5. [PubMed: 15947625]

36. BUMP RC, SUGERMAN HJ, FANTL JA, MCCLISH DK. Obesity and lower urinary tract function in women: effect of surgically induced weight loss. Am J Obstet Gynecol 1992;167:392–7. [PubMed: 1497041]discussion 397–9

37. VIKTRUP L, PANGALLO BA, DETKE MJ, ZINNER NR. Urinary Side Effects of Duloxetine in the Treatment of Depression and Stress Urinary Incontinence. Prim Care Companion. J Clin Psychiatry 2004;6:65–73.

38. TADIC SD, ZDANIUK B, GRIFFITHS D, ROSENBERG L, SCHAFER W, RESNICK NM. Effect of biofeedback on psychological burden and symptoms in older women with urge urinary incontinence. J Am Geriatr Soc 2007;55:2010–5. [PubMed: 18028340]

Table 1

Demographic and clinical characteristics of PRIDE participants by presence of depressive symptoms

Characteristic	No Depressive Symptoms (N=237)	Depressive Symptoms* (N=101)	P-Value
Age (Mean ±SD)	53.5 (10.3)	50.7 (10.1)	.03
White Race	184 (78)	78 (72)	.93
Education >High School	211 (89)	82 (81.2)	.05
BMI (Mean ±SD)	36.0 (5.6)	37.3 (5.6)	.06
Current Smoker	10 (4)	8 (8)	.17
Number of incontinent episodes per week (Mean ±SD)**			
Total	23 (18)	28 (19)	.005
Stress	9 (10)	11 (12)	.05
Urge	13 (13)	16 (17)	.31
Beck Depression Inventory score (Mean ±SD)	4.1 (2.6)	15.3 (4.8)	<.001
Urogenital Distress Inventory score (Mean ±SD) ‡	162 (55)	176 (46)	.02
Incontinence Impact Questionnaire score (Mean ±SD) ‡	97 (65)	136 (78)	<.001

Data presented as N, (%) unless otherwise indicated

* Beck Depression Inventory (BDI) score ≥ 10

** Based on 7-day voiding diary.

‡ The Incontinence Impact Questionnaire and Urogenital Distress Inventory are scored on a scale of 0–400, with a higher score representing greater impact.

Table 2

Association between urinary incontinence and depressive symptoms (N=338)[*†]

Predictor of depressive symptoms	Adjusted OR	95% Confidence Interval	P-value
Frequency of urinary incontinence (per 7 episodes)	1.10	1.01–1.21	0.03
UDI Score (per 50 units)	1.27	1.01–1.60	0.04
IIQ Score (per 50 units)	1.44	1.22–1.71	<.0001

[*] Adjusted OR, 95% CI and p-values obtained from 3 separate multivariable logistic regression models.

[†] All models adjusted for age, education level and BMI.